

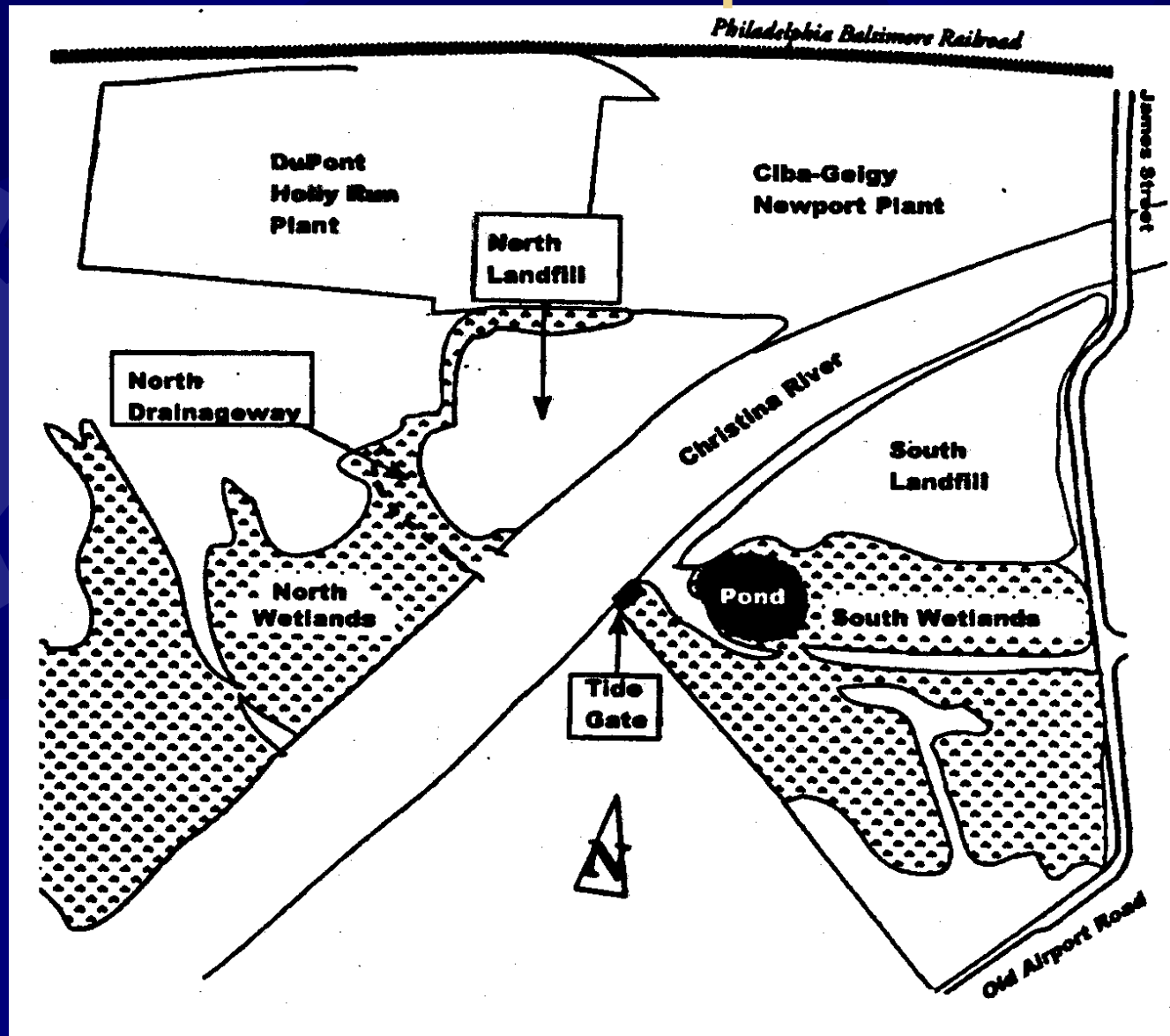
Developing Clean-up Criteria
when your “Weight-of-
Evidence” goes to Weight
Watchers but eats at
McDonalds



DuPont-Newport Superfund Site

Along Christina River
Newport, Delaware

DuPont-Newport Site



North Wetlands

~7 Acres

	Site (ppm)	AET	ER-L
Lead	40,500	400	46.7
Zinc	19,300	410	150
Cadmium	255	3	1.2
Barium	4,510	48	-
Copper	4,130	390	34
Chromium	576	62	81
Arsenic	435	35	8.2

South Wetlands/Pond

~15 Acres

	Site (ppm)	AET	ER-L
Lead	5,550	400	46.7
Zinc	12,800	410	150
Cadmium	77	3	1.2
Barium	34,700	48	-
Copper	1,190	390	34
Chromium	72	62	81
Arsenic	-	35	8.2

Christina River

6 ft tidal swing

	Site (ppm)	AET	ER-L
Lead	2,170	400	46.7
Zinc	12,500	410	150
Cadmium	1,070	3	1.2
Barium	12,000	48	-
Copper	147	390	34
Chromium	488	62	81
Arsenic	131	35	8.2

Weight-of-Evidence

- ✱ Sediment triad
 - ✱ Sediment chemistry
 - ✱ Toxicity tests
 - ✱ Benthic studies
- ✱ Fish tissue
- ✱ Plant tissue
- ✱ Surface water chemistry
- ✱ Field observations/Aerial photography
- ✱ Terrestrial mammal literature review

Sediment Toxicity Tests

☀ Elutriate

- ☀ Fathead minnows
- ☀ Water fleas

☀ Solid Phase

- ☀ *Chironomus tentans*
- ☀ *Hyallela azteca*

Benthic Studies

- ✱ Density
- ✱ Diversity
- ✱ Richness

Weight-of-Evidence

- ★ SOME stations showed signs of significant impact
- ★ OFTEN, high contaminant concentrations without much impact
- ★ No single type of test correlated well with the chemistry

Weight-of-Evidence

- ★ Of the 22 Triad stations, 6 warranted cleanup
 - ★ Extremely low benthic density, low *Chironomus tentans* survival, no vegetation present
 - ★ Low benthic diversity, low *Hyallela azteca* survival, high percentage of pollution tolerant benthos
 - ★ Low taxa richness, extremely high percentage of pollution tolerant benthos
 - ★ Low taxa richness, extremely high percentage of pollution tolerant benthos, low *Chironomus tentans* survival

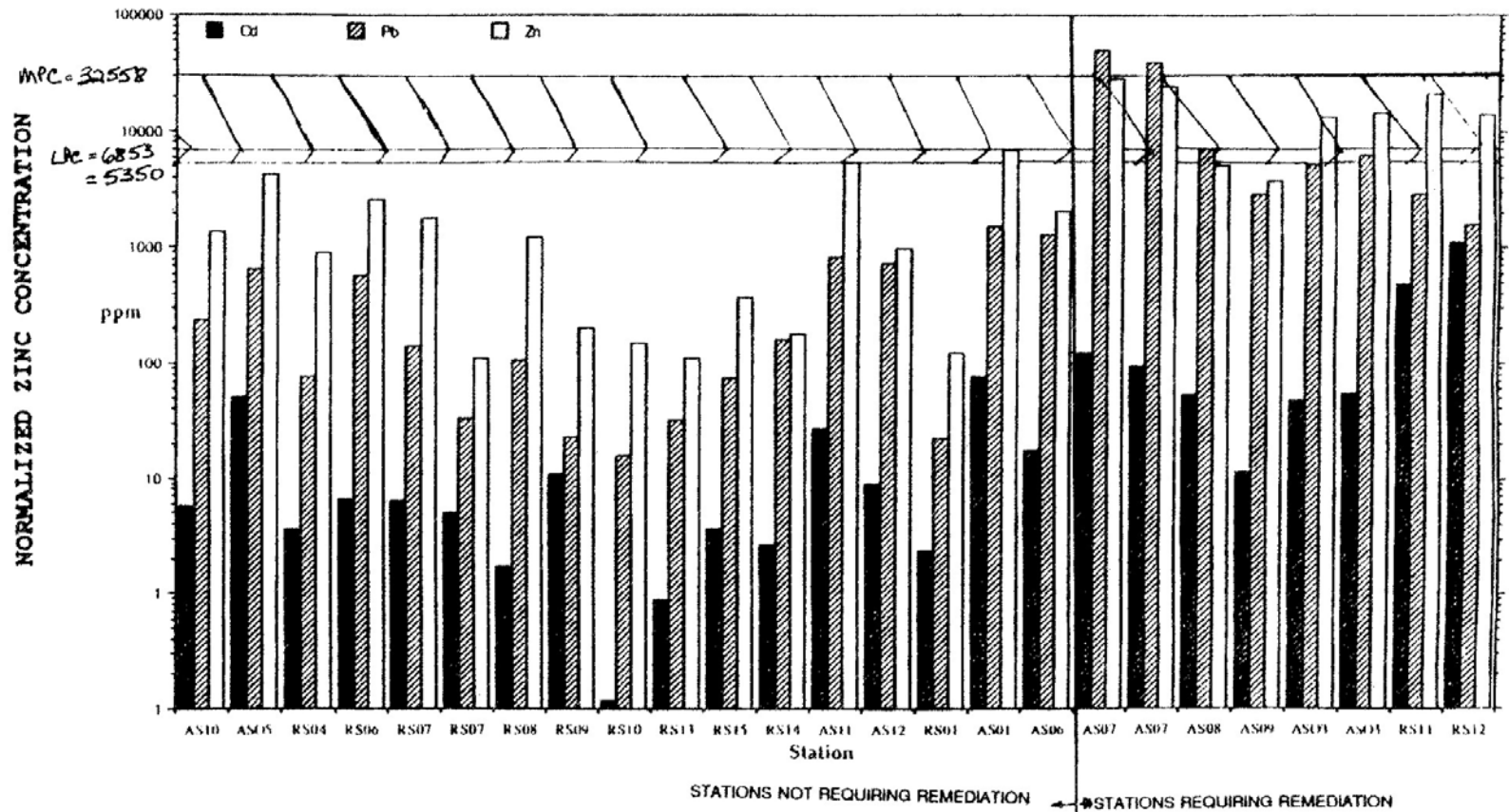
Implementation

- ★ Conduct multiple tests at grid locations to guide excavation/dredging

-OR-

- ★ Set easy-to-use chemistry criteria that guide the cleanup at the appropriate locations

ZINC



Sediment Clean-up Criteria

	Criteria (ppm)	AET	ER-L
Lead	1200 700	660	35
Zinc	5600 3000	1600	120
Cadmium	60 20	9.6	5

Lessons Learned

- ★ PRPs: When benthos *totally* disappear, the desire to cleanup will appear.
- ★ BTAG/NRT: When contamination is really high, there must be a test where the critters die.
- ★ BOSS: Projects that don't move through the pipeline are gonna affect your promotion timeline.

Lessons Learned

- ✱ Initial problem definition is critical
- ✱ Definitely use site-specific data to determine bioavailability
- ✱ Need to have Triad stations across a broad range of contaminant levels in each ecological setting

Lessons Learned

- ✱ Weight-of-Evidence approach requires a lot of professional judgment - making decisions a challenge
- ✱ Setting sediment clean-up criteria is part of the risk management decision making process

Need for Further Information

- ★ Meaning of: “Superfund’s goal is to reduce ecological risks to levels that will result in the recovery and maintenance of healthy local populations and communities of biota.”
- ★ When/how could the bioavailability change?
How to take this into account for today’s cleanup?

North Wetland Construction



North Wetland Construction



North Wetland Today

